

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

Listing of Claims:

1. (Currently Amended) A liquid crystal display device comprising:

(i) a liquid crystal element comprising:

5 a front substrate which is arranged at a front side of the liquid crystal element, which corresponds to a viewing screen side of the display device;

a back substrate which is arranged at a back side of said front substrate so as to be opposed to said front substrate;

10 at least one first electrode which is formed on an internal surface of said front substrate, which is opposed to an internal surface of said back substrate;

at least one thin film transistor which is arranged on the internal surface of said back substrate and driven by a drive signal;

15 at least one second electrode which: (i) comprises a transparent conductive film, (ii) is arranged on the internal surface of said back substrate so as to be opposed to said at least one first electrode, and which (iii) is connected to said thin film transistor, thereby forming at least one pixel in a
20 region that does not overlap with a region where the thin film transistor is formed and that is included in an area where said

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

at least one first electrode and said at least one second
electrode are opposed to each other;

25 a liquid crystal layer which is sandwiched between said
front substrate and said back substrate;

at least one reflective film which is ~~provided at a~~
~~side of said back substrate with respect to said liquid crystal~~
~~layer~~ positioned between said second electrode and the internal
surface of said back substrate so as to correspond to a part of
30 said region in which said at least one pixel is formed that does
not overlap with the region where the thin film transistor is
formed, such that a reflective portion for reflecting incident
light and a transmissive portion, in a region other than said
reflective portion, for transmitting incident light are formed in
35 said at least one pixel;

a color filter which is provided on one of the internal
surface of the front substrate and the internal surface of the
back substrate so as to correspond to said at least one pixel,
and which has an opening formed by removing said color filter at
40 a position such that said opening corresponds to a part of said
reflective portion, which is in said region that does not overlap
the region where said thin film transistor is formed; and

a liquid crystal layer thickness adjusting layer which
is provided in at least a region corresponding to said reflective
45 portion between said front substrate and said back substrate, in

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

order to set a thickness of said liquid crystal layer in said reflective portion to be thinner than a thickness of said liquid crystal layer in said transmissive portion;

50 (ii) a front polarizing plate and a back polarizing plate which are arranged at the front side and a back side of said liquid crystal element, respectively; and

(iii) a backlight which is arranged at a back of said back polarizing plate.

2. (Withdrawn) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a thickness of said color filter in said reflective portion is thinner than a
5 thickness of said color filter in said transmissive portion.

3. (Previously Presented) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a thickness of said color filter in said reflective portion is equal to a
5 thickness of said color filter in said transmissive portion.

4. (Withdrawn - Currently Amended) The liquid crystal display device according to claim 1, wherein a thickness of said liquid crystal layer thickness adjusting layer is set such that a

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

thickness of said color filter in said reflective portion is
5 thinner than a thickness of said color filter in said
transmissive portion.

5. (Withdrawn) The liquid crystal display device according to claim 4, further comprising a flattening film which is formed on said color filter in order to flatten a surface of said color filter, which has different thicknesses.

6. (Withdrawn) The liquid crystal display device according to claim 4, wherein said liquid crystal element is an STN (Super Twisted Nematic) liquid crystal display element.

7. (Original) The liquid crystal display device according to claim 1, wherein said liquid crystal element comprises a homogeneous liquid crystal layer in which liquid crystal molecules are oriented substantially in parallel with surfaces of
5 a pair of substrates without being twisted between the substrates in a non electric field state where no electric field is applied.

8. (Previously Presented) The liquid crystal display device according to claim 1, wherein said liquid crystal layer thickness adjusting layer comprises a transparent insulation film.

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

Claim 9 (Canceled).

10. (Previously Presented) The liquid crystal display device according to claim 1, wherein said liquid crystal layer thickness adjusting layer fills said hole formed in said color filter.

11. (Previously Presented) The liquid crystal display device according to claim 1, wherein said liquid crystal layer thickness adjusting layer fills said hole formed in said color filter and covers said color filter.

12. (Withdrawn) The liquid crystal display device according to claim 1, wherein:

said liquid crystal layer thickness adjusting layer is formed on a surface of one of said front substrate and said back
5 substrate; and

said color filter is formed such that a part of said color filter covers said liquid crystal layer thickness adjusting layer.

13. (Currently Amended) The liquid crystal display device according to claim 1, wherein said reflective layer comprises a reflective surface on which depressions and protrusions are formed.

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

14. (Previously Presented) The liquid crystal display device according to claim 1, wherein:

a value of a product $\Delta n \cdot d1$ of a thickness $d1$ and a refractive index anisotropy Δn of said liquid crystal layer in said reflective portion is set to a value which makes said liquid crystal layer provide a retardation of $1/4$ wavelength to light transmitted therethrough in a non electric field state in which substantially no electric field is applied between the first and second electrodes opposed to each other; and

a value of a product $\Delta n \cdot d2$ of a thickness $d2$ and a refractive index anisotropy Δn of said liquid crystal layer in said transmissive portion is set to a value that makes said liquid crystal layer provide a retardation of $1/2$ wavelength to light transmitted therethrough in the non electric field state.

15. (Previously Presented) The liquid crystal display device according to claim 14, further comprising a front retardation plate and a back retardation plate which are respectively arranged between said front polarizing plate and said liquid crystal layer and between said back polarizing plate and said liquid crystal layer such that slow axes thereof are orthogonal to each other, and which provide a retardation of $1/4$ wavelength to light transmitted therethrough;

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

wherein said front polarizing plate and said back polarizing
10 plate are arranged such that the transmission axes thereof are
orthogonal to each other; and

wherein said front retardation plate is arranged so as to
cancel the retardation provided to the light transmitted
therethrough by said liquid crystal layer in the non electric
15 field state.

16. (Previously Presented) The liquid crystal display
device according to claim 15, further comprising a scattering
reflective plate which is arranged between said front polarizing
plate and said liquid crystal layer and which scatters a portion
of light incident thereon.

17. (Currently Amended) A liquid crystal display device
comprising:

(i) a liquid crystal element comprising:

a front substrate which is arranged at a front side of
5 the liquid crystal element, which corresponds to a viewing screen
side of the display device;

a back substrate which is arranged at a back side of
said front substrate so as to be opposed to said front substrate;

at least one opposite electrode which is formed on an
10 internal surface of said front substrate;

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

a plurality of thin film transistors which are arranged on an internal surface of said back substrate and which are driven by a drive signal;

a plurality of pixel electrodes, each of which
15 comprises a transparent conductive film, and which: (i) are arranged on the internal surface of said back substrate so as to be opposed to said at least one opposite electrode, and which
(ii) are connected to said thin film transistors, thereby forming a plurality of pixels in areas where said at least one opposite
20 electrode and said plurality of pixel electrodes are opposed to each other;

a liquid crystal layer which is sandwiched between said front substrate and said back substrate;

a plurality of reflective films which are ~~provided on~~
25 ~~the internal surface of said back substrate~~ positioned between
the plurality of pixel electrodes and the internal surface of
said back substrate so as to respectively correspond to parts of regions, in which said plurality of pixels are formed and which do not overlap with regions where said thin film transistors are
30 formed, such that a reflective portion for reflecting incident light and a transmissive portion, in a region other than said reflective portion, for transmitting incident light are formed in each of said plurality of pixels;

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

a color filter which is provided on the internal
35 surface of said front substrate so as to correspond to said
plurality of pixels, and

liquid crystal layer thickness adjusting layers which
are provided in regions corresponding to at least said reflective
portions on said color filter, in order to set a thickness of
40 said liquid crystal layer in said reflective portions to be
thinner than a thickness of said liquid crystal layer in said
transmissive portions;

(ii) a front polarizing plate and a back polarizing plate
which are arranged at the front side and a back side of said
45 liquid crystal element, respectively; and

(iii) a backlight which is arranged at a back of said back
polarizing plate.

18. (Previously Presented) The liquid crystal display
device according to claim 17, wherein:

thicknesses of said respective liquid crystal layer
thickness adjusting layers are set such that a thickness of said
5 color filter in said reflective portions is equal to a thickness
of said color filter in said transmissive portions;

said color filter has holes formed by removing parts of said
color filter at portions corresponding to said reflective
portions of said plurality of pixels; and

Application No. 10/812,765
Response to Final Office Action

Customer No. 01933

- 10 said liquid crystal layer thickness adjusting layers fill
said holes formed in said color filter and cover said color
filter.

Claims 19 and 20 (Canceled).